

TWO UNUSUAL CHIONANTHUS SPECIES FROM BORNEO AND THE POSITION OF MYXOPYRUM IN THE OLEACEAE

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CHIONANTHUS Linnaeus (including *Linociera* Sw.—Stearn, 1976), with about 70 species described, is the largest genus of the Oleaceae in Malesia but the least well known. As study of the genus progresses, it is possible to appreciate the range of variation within the genus; for example, study of the Malayan species shows that there are intermediate species with characters of both sections CERANTHUS Benth & Hooker and EULINOCIERA Benth & Hooker (Kiew, 1979), and investigation of the Bornean species reveals a much wider range in inflorescence and fruit form than was previously described (Kiew, 1980).

THE PROBLEM OF LINOCIERA MACROBOTRYS

In the revision of the Sarawak species (Kiew, 1980), specimens of *Linociera macrobotrys* Merr. were not available for study. On the grounds of two unusual characters for the genus—its habit (it is a shrub 2 m tall) and its terminal inflorescence—the species was excluded from the genus with a note that its description closely matched that of *Myxopyrum enerve* Van Steenis. In the Kew and Leiden herbaria, specimens identified as *L. macrobotrys* are in fact the small-leaved form of *M. enerve*.

The type of *Linociera macrobotrys* was subsequently traced to the herbarium of the Arnold Arboretum. Examination showed that the inflorescence is not terminal but axillary, and that the flowers are all staminate (a character not mentioned in Merrill's description (1918)).

The tendency toward unisexual flowers is seen in several Malesian genera of the tribe Oleae Benth & Hooker. *Olea* L. has polygamous species. *Osmanthus* Lour. generally has unisexual flowers (Green, 1958), although the Malesian species, *O. scortechinii* King, is hermaphrodite. The vast majority of *Chionanthus* species have hermaphrodite flowers, but polygamous species do exist (for example, the well-known Chinese fringe tree, *Chionanthus retusus* Lindley & Paxton, and *C. enerve* (see below)). There are also unisexual species such as *Linociera oxycarpa* Lingelsh. and *L. rupicola* Lingelsh., both from New Guinea, and *C. macrobotrys*, as yet known only from a staminate specimen from Sarawak.

Lingelsheim (1927), in his study of the Oleaceae in New Guinea, mentioned that the polygamous and unisexual *Chionanthus* species, in which the filament is fused to the corolla, could be distinguished from those of *Olea*, in which the

filament is free. In all Malesian species of *Chionanthus* investigated so far (both those with hermaphrodite and those with staminate flowers), the filament is always short and is fused near the base of the corolla. The connective varies in width (FIGURE 1, d–i) and is apiculate in some species (FIGURE 1, g). With the exception of *O. paniculata* R. Br. (FIGURE 1, c), in which the filament is not only free from the corolla but also versatile, the Malesian *Olea* species have similar stamens with short filaments fused to the corolla (FIGURE 1, a, b). Staminal characters can therefore not be used as a generic distinction between *Chionanthus* and *Olea*.

Chionanthus macrobotrys has staminate flowers and oblong corolla lobes with a rounded apex, which are also found in the *Olea* species in Borneo, *O. decussata* (Heine) Kiew and *Olea javanica* (Blume) Knoblauch. *Chionanthus macrobotrys* is distinguished from these *Olea* species by the absence of the rounded bud characteristic of *Olea* and by the corolla that is divided more than halfway. These characters confirm this taxon as a species of *Chionanthus*.

***Chionanthus macrobotrys* (Merr.) Kiew, comb. nov.**

Linociera macrobotrys Merr. Philipp. J. Sci. **13**: 117. 1918. TYPE: Sarawak, 1st Division, Mount Poe [Gunung Pueh], *Foxworthy* 369 (A).

Shrub 2 m tall. Twigs terete, brown becoming grayish with age, minutely hirsute. Leaves with petiole 5 mm long; blade lanceolate, 5–5.5 by 2–2.5 cm, acute at apex, entire and recurved at margin, cuneate at base, coriaceous, minutely punctate below, glabrous; midrib impressed above, with lateral veins ca. 4 pairs, obscure above and below. Inflorescence a lax panicle with fourth-order branching, axillary, minutely hirsute, 14.5 cm long, lowest second-order branches 9 cm long; bracts oval, 2–3 mm long. Staminate flowers yellowish, 2 mm long; pedicel 2–3 mm long; calyx 0.5 mm long, deeply divided to base, lobes acute, glabrous; corolla 2 mm long, lobes 1 mm long, induplicate-oblong with rounded apex, joined in pairs for 1 mm at base; stamens 2, connate to base of corolla, the anthers almost sessile, to 1 mm long, connective ca. 0.5 mm wide. Ovary absent. Pistillate or hermaphrodite flowers and fruits unknown.

This description differs in two important respects from that of Merrill: the inflorescence is axillary (not terminal as Merrill reported), and the flowers are staminate. The species is known from a single locality, Gunung Pueh, and Merrill cited two specimens, *Foxworthy* 369 (type) and 290; I have not been able to locate the latter. On the herbarium label Foxworthy noted that the plant grows in forests on the upper slopes of the mountain between 1500 and 1700 m. He gave “barungian batu” as the Dyak name.

Among the Bornean *Chionanthus* species, *C. macrobotrys* most resembles *C. ramiflorus* Roxb. in its rounded corolla lobes (FIGURE 1, e, h) and in its lax, much-branched panicle. However, the flowers of *C. ramiflorus* are hermaphrodite and the leaves are larger. Merrill (1918) considered the leaves of *C. macrobotrys* to be unusual in their small size and coriaceousness, but those of the montane form of *C. laxiflorus* Blume and the small-leaved form of *C. enerve* are very similar. Of the Bornean species other than *C. macrobotrys*, only *C. longipetalus* (Merr.) Kiew is a shrub.

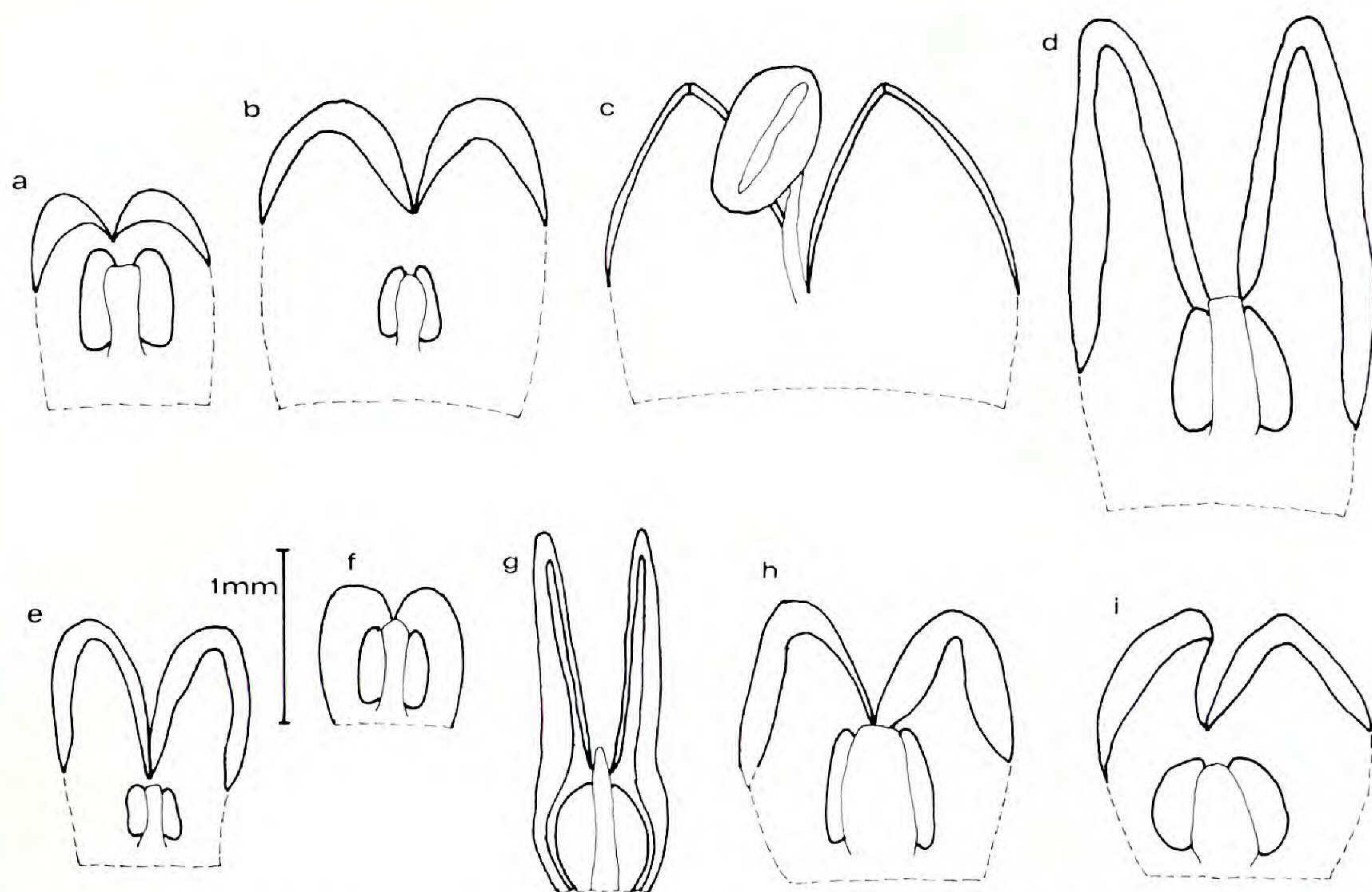


FIGURE 1. Stamen attachment in staminate and hermaphrodite flowers of *Olea* and *Chionanthus* (including *Linociera*): a, *Olea decussata* (staminate, Chew 939); b, *O. brachiata* (hermaphrodite, Ahmad s.n.); c, *O. paniculata* (hermaphrodite, Schodde & Craven 5061); d, *Chionanthus porcatus* (hermaphrodite, Anderson 20044); e, *C. ramiflorus* (hermaphrodite, Van Royen & Sleumer 6939); f, *Linociera oxycarpa* (staminate, NGF 42633); g, *L. rupicola* (staminate, TGH 13667); h, *C. macrobotrys* (staminate, Foxworthy 369); i, *C. enerve* (staminate, Collenette 905).

THE PROBLEM OF MYXOPYRUM ENERVE

The matching descriptions of *Linociera macrobotrys* (which is a species of *Chionanthus*) and *Myxopyrum enerve* Van Steenis and the identification of specimens of *M. enerve* as *L. macrobotrys* have led me to reexamine the position of *M. enerve*. *Myxopyrum enerve* is atypical of *Myxopyrum* Blume in that its leaves are not triplinerved and its stem is terete.

This species also differs in its leaf anatomy from *Myxopyrum coriaceum* Blume and *M. nervosum* Blume. In these *Myxopyrum* species foliar sclereids are confined to below the midrib and only brachysclereids are present; in *M. enerve* there are dendrosclereids throughout the lamina (FIGURE 2, C) as well as brachysclereids in the midrib and the petiole. In both *M. coriaceum* and *M. nervosum* the xylem forms several discrete blocks in the petiole; in *M. enerve* it is crescent shaped (FIGURE 3). In addition, there is a difference in position of the ovules—pendulous in *M. enerve* and ascending in *M. coriaceum* and *M. nervosum* (although Van Steenis (1967) reported that the specimen of *M. nervosum* he had examined had pendulous ovules).

In all these characters, *Myxopyrum enerve* resembles *Chionanthus* and not *Myxopyrum*. Species of *Chionanthus* have pinnate venation, terete stems, dendrosclereids in the lamina, crescent-shaped xylem in the petiole (Kiew & Ibra-



FIGURE 2. Cross sections of laminae: A, *Myxopyrum coriaceum* (S 25442, Anderson), $\times 370$; B, *M. nervosum* (Henderson 32382), $\times 370$; C, *Chionanthus enerve* (S 22740, Asah Luang), $\times 185$.

him, 1982), corolla lobes longer than the tube, and pendulous ovules. Herbarium specimens of *M. enerve* also have black petioles, a character found in *Chionanthus* but not in *Myxopyrum*. The small flowers fall within the range of flower size for *Chionanthus* (2–9 mm long; Kiew, 1980). Two characters unusual for *Chionanthus* are the scandent habit and the terminal inflorescence. However, another Bornean species, *C. longipetalus* (Merr.) Kiew, is a shrubby species that has once (S 21498, Ashton) been recorded as climbing, and *C. retusus* has a terminal inflorescence. For all these reasons, *M. enerve* is undoubtedly a species of *Chionanthus*.

***Chionanthus enerve* (Van Steenis) Kiew, comb. nov.**

Myxopyrum enerve Van Steenis, *Blumea* **15**: 152, fig. 3, 1967. TYPE: Sarawak, 4th Division, Gunung Dulit, S 22740, Asah Luang (holotype, L).

Woody scandent climber 2–5 m long. Twigs terete, lenticellate, drying gray. Leaves with petiole 0.5–1.5 cm long, grooved above, drying black; blade ovate-lanceolate, 4.5–12.5 by 1.5–6.5 cm, acute to acuminate at apex, truncate to rounded at base, entire and recurved at margin, thickly coriaceous, glabrous, punctate below toward base of leaf; midrib depressed above, prominent below, with lateral veins 5 to 8 pairs, slightly impressed above and below. Inflorescence paniculate, terminal in flower but becoming displaced to lateral position in fruit, 4–12 cm long, once branched, lowest branches less than half length of inflorescence; bracts foliaceous, 4–7 by 1–3 mm. Flowers polygamous, greenish yellow, 1.5–2 mm long; pedicel 1–2 mm long; calyx 4-lobed, deeply divided to base, margin finely ciliate; corolla 1–2 mm long, lobes 4, induplicate, reaching to base, rounded at apex; stamens 2, the anthers almost sessile, 1.5 mm long, connective broad; ovary 1 mm long, ovoid, 2-loculate, each locule with 2 pendulous ovules, stigma 2-lobed; staminate flowers without vestige of ovary but otherwise similar. Fruits ovoid, 4–7 by 3–6 mm, minutely apiculate, green ripening purple, endocarp brittle; seed 1, endosperm copious.

HABITAT. Mossy forest on exposed summits or ridges, 780–2500 m; once recorded from mossy limestone cliff (Gunung Api).

VERNACULAR NAME. *Batu lawi* (Kelabit).

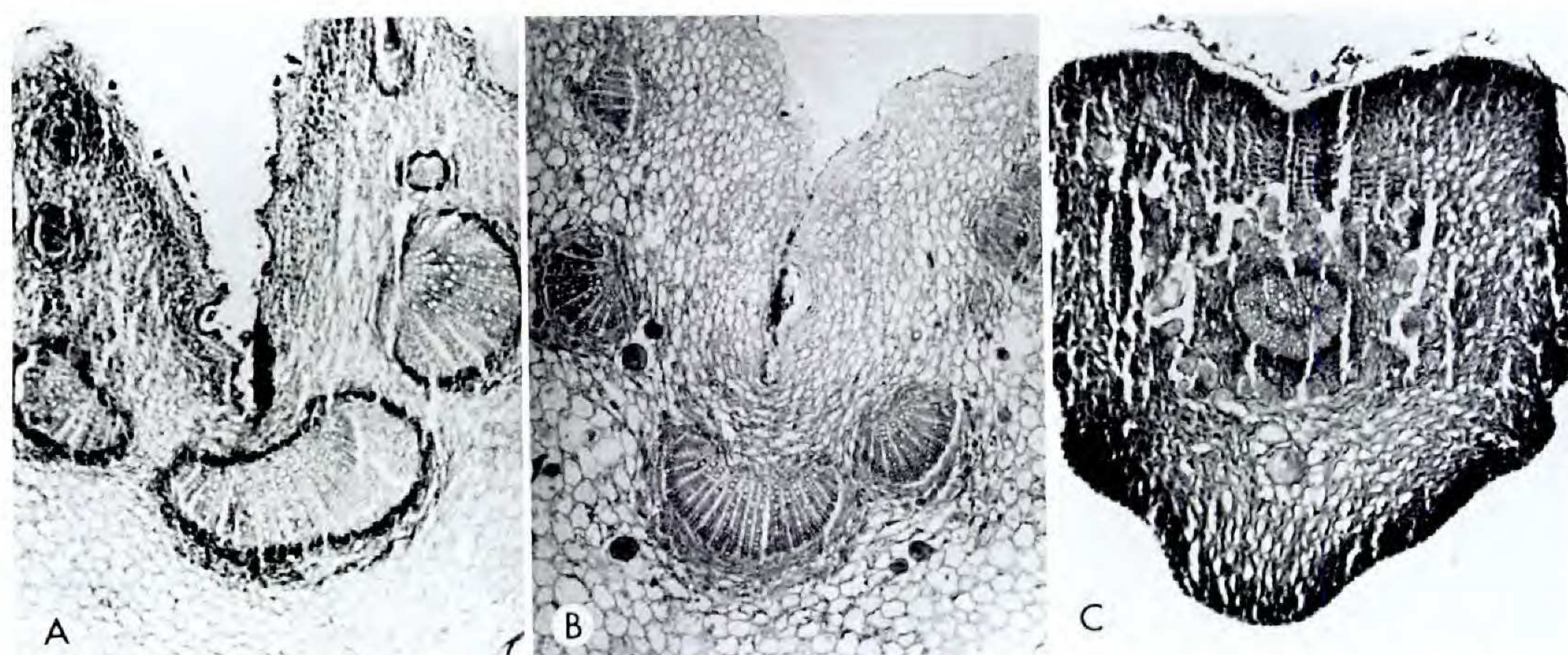


FIGURE 3. Cross sections of petioles: A, *Chionanthus enerve* (S 22740, Asah Luang), $\times 12$; B, *Myxopyrum nervosum* (Henderson 32382), $\times 20$; C, *M. coriaceum* (S 25442, Anderson), $\times 25$.

SPECIMENS EXAMINED. **Borneo.** SABAH: Kinabalu, *Clemens* 28777 (BO), 30910 (BO, K), 31442 (BO), 32834 (BO), 40183 (BO), 40704a (K, L), 50128 (K), 51469 (K); *Chew & Corner* 4499 (K); *Collenette* 905 (K). SARAWAK, 1st Division: Gunung Santubong, *Martin* S 37597 (SAR). 2nd Division: Lubok Antu, S 33831, *Chai* (KEP, SAR), S 33950, *Chai* (SAR), S 33953, *Chai* (SAR). 4th Division: Gunung Dulit, S 22740, *Asah Luang* (L); Gunung Api, S 30433, *Chai* (SAR); Kelabit Highlands, *Nooteboom & Chai* 2263 (SAR). KALIMANTAN: Gunung Semedoem, *Hallier* 688 (BO), 709 (BO).

Van Steenis (1967) based his description on a single specimen, but this species has been collected from exposed hilltops and ridges from 780 to 2500 m throughout Sarawak and Sabah. There is considerable range in leaf size (from that of the type specimen, 7.5–12 by 3–6 cm, to small-leaved plants such as *Clemens* 40704a, 4.5–7 by 1.5–2.75 cm) and inflorescence length (4 cm in *Clemens* 40704a vs. 7.5–9 cm in the type). Among the species from Sarawak, the combination of coriaceous, lanceolate leaves and paniculate inflorescence is found only in *Chionanthus laxiflorus*. *Chionanthus enerve* can be distinguished from this species by its scandent (vs. arboreal) habit, its terminal inflorescence with short lower secondary branches (vs. branches more than one-third the length of the inflorescence), and its elliptic (vs. obpyriform) fruit.

Although the type specimen has hermaphrodite flowers, other specimens (S 30433, *Chai*, and *Collenette* 905) have staminate flowers; the species is therefore polygamous.

POSITION OF MYXOPYRUM IN THE OLEACEAE

Bentham and Hooker (1876) recognized four tribes in the Oleaceae and placed *Myxopyrum* in tribe Oleineae together with *Olea* and *Ligustrum* L., which have induplo-valvate corolla lobes and albuminous seeds. Knoblauch (1895) recognized two subfamilies: Jasminoideae (containing the single tribe Jasmineae), with bilobed fruits and amphitropous or anatropous seeds; and Oleoideae (containing three tribes), with unlobed fruits and—except in *Mayerpea* Aublet and *Myxopyrum*—pendulous seeds. *Myxopyrum* was isolated

TABLE 1. Common characters of *Myxopyrum* and tribe Oleeeae, compared with those of tribe Jasmineae.

CHARACTER	MYXOPYRUM AND OLEEAE	JASMINEAE
Leaf	Simple	Unifoliate, trifoliate, or pinnate
Corolla		
Lobes	4	4 to 12
Tube	Medium to short or absent	Long to medium
Style	Medium to short or absent	Long to medium
Aestivation	Valvate (except in <i>Osmanthus</i>)	Imbricate
Fruit	Not bilobed	Bilobed
Flavones	Present	Absent

from the other genera in tribe Oleineae by its ascending anatropous seeds. Solereder (1891) wrote that ovule position in *Mayepea* (now *Chionanthus*) is not uniform and detailed three positions: pendulous (most species), attached laterally, and attached almost at the base. Van Steenis's report (1967) of pendulous ovules in *Myxopyrum nervosum* (I find them to be ascending) is another indication that ovule position should not be used as a key character in delimiting the subfamilies.

Johnson (1957) expanded the scope of subfamily Jasminoideae to include five tribes: Jasmineae Benth. & Hooker (the only tribe with bilobed fruits), Forsythieae H. Taylor ex L. Johnson, Fontanesieae H. Taylor ex L. Johnson, Schrebereae L. Johnson, and the monogeneric Myxopyreae L. Johnson (provisionally placed in the subfamily). His subfamily Oleoideae included only two tribes, Fraxineae (*Fraxinus* L.) and Oleeeae (which in Malesia included *Chionanthus*, *Ligustrum*, *Olea*, and *Osmanthus*). The latter is a natural group characterized by two pendulous ovules in each locule of the ovary and by a basic chromosome number of 23.

Apart from its scandent habit and the position of its ovules, *Myxopyrum* has little in common with the Jasminoideae and in particular with *Jasminum* L., the other Malesian climbing genus. If a wider range of characters is examined (see TABLE 1), it is obvious that *Myxopyrum* has more in common with Johnson's tribe Oleeeae than with the Jasmineae. If keyed out under his subfamily Oleoideae, *Myxopyrum* splits: species with a fleshy, urceolate corolla key out under *Noronhia* Stadm. ex Thou. (a similarity already noted by Blume, 1850), and those with the tube shorter than the lobes key out under *Olea* (*Tetrapilus* Lour.) and *Chionanthus* (*Linociera*). In addition, *Myxopyrum nervosum* has flavone (apigenin) glycosides that are present in genera of subfamily Oleoideae but absent in those of subfamily Jasminoideae (Harborne & Green, 1980).

Based on a combination of leaf, flower, and fruit characters, rather than on the single character of ovule position, *Myxopyrum* should be transferred to subfamily Oleoideae (Kiew, 1981). However, although *Myxopyrum* shows similarities to genera of tribe Oleeeae, it is distinct in several respects. In addition to its climbing habit, quadrangular stem, triplinerved leaves, and ascending

ovules, it differs from all other oleaceous genera in two other characters. The separate blocks of xylem (FIGURE 3) have not been recorded from other genera of the Oleaceae, which have either a medullated cylinder (reported from *Chionanthus*, *Fraxinus*, and *Osmanthus*) or crescent-shaped xylem (reported from *Chionanthus*, *Fontanesia* Labill., *Jasminum*, *Ligustrum*, *Notelaea* Vent., *Olea*, *Osmanthus*, *Phillyrea* L., and *Syringa* L.) (Metcalf & Chalk, 1950; Kiew & Ibrahim, 1982). The flavones present in *M. nervosum* are three unidentified glycosides of apigenin not found in the other genera of Oleoideae so far investigated (Harborne, pers. comm.). The chromosome number of *Myxopyrum* is still unknown. Because of these distinct characters, *Myxopyrum* should be retained in the separate tribe Myxopyreae, which is included in subfamily Oleoideae.

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